# Anterior Resection for Rectal Cancer With Mesorectal Excision

## *A Prospective Evaluation of 622 Patients*

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**Objective:** This study aims to review the operative results and oncological outcomes of anterior resection for rectal and rectosigmoid cancer. Comparison was made between patients with total mesorectal excision (TME) for mid and distal cancer and partial mesorectal excision (PME) for proximal cancer, when a 4- to 5-cm mesorectal margin could be achieved. Risk factors for local recurrence and survival were also analyzed.

**Summary Background Data:** Anterior resection has become the preferred treatment option rectal cancer. TME with sharp dissection has been shown to be associated with a low local recurrence rate. Controversies still exist as to the need for TME in more proximal tumor.

**Methods:** Resection of primary rectal and rectosigmoid cancer was performed in 786 patients from August 1993 to July 2002. Of these, 622 patients (395 men and 227 women; median age, 67 years) underwent anterior resection. The technique of perimesorectal dissection was used. Patients with mid and distal rectal cancer were treated with TME while PME was performed for those with more proximal tumors. Prospective data on the postoperative results and oncological outcomes were reviewed. Risk factors for anastomotic leakage, local recurrence, and survival of the patients were analyzed with univariate and multivariate analysis.

**Results:** The median level of the tumor was 8 cm from the anal verge (range, 2.5–20 cm) and curative resection was performed in 563 patients (90.5%). TME was performed in 396 patients (63.7%). Significantly longer median operating time, more blood loss, and a longer hospital stay were found in patients with TME. The overall operative mortality and morbidity rates were 1.8% and 32.6%, respectively, and there were no significant differences between those of TME and PME. Anastomotic leak occurred in 8.1% and 1.3% of patients with TME and PME, respectively ($P < 0.001$). Independent factors for a higher anastomotic leakage rate were TME, the male gender, the absence of stoma, and the increased blood loss. The 5-year actuarial local recurrence rate was 9.7%. The advanced stage of the disease and the performance of coloanal anastomosis were independent factors for increased local recurrence. The 5-year cancer-specific survival was 74.5%. The independent factors for poor survival were the advanced stage of the disease and the presence of lymphovascular and perineural invasion.

**Conclusions:** Anterior resection with mesorectal excision is a safe option and can be performed in the majority of patients with rectal cancer. The local recurrence rate was 9.7% and the cancer-specific survival was 74.5%. When the tumor requires a TME, this procedure is more complex and has a higher leakage rate than in those higher tumors where PME provides adequate mesorectal clearance. By performing TME in patients with mid and distal rectal cancer, the local control and survival of these patients are similar to those of patients with proximal cancers where adequate clearance can be achieved by PME.

(*Ann Surg* 2004;240: 260–268)

In the recent 2 decades, improvements have been achieved in the outcomes of rectal cancer surgery with the advances in surgical techniques as well as adjuvant therapy. Abdominoperineal resection, the previous gold standard treatment of rectal cancer, has been regarded as unnecessary in most patients with rectal cancer and more patients can now be treated with sphincter-saving surgery. The increased understanding of the spread of the disease has contributed significantly to this change. Distal mural spread of the disease was shown to be rarely more than 2 cm,[1] and the allowance of a close distal margin has led to an increased incidence of sphincter-saving operations. Moreover, safe anastomoses at the distal rectum or the anal canal have been made possible by the advances of mechanical stapling devices and the development of the double stapling technique[2,3].

Local recurrence has always been a formidable problem following rectal cancer surgery. Conventional rectal mobilization by blunt dissection has been associated with a high local recurrence rate.[4–6] The importance of the complete removal of the lymphovascular tissue surrounding the rectum

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ISSN: 0003-4932/04/24002-0260

DOI: 10.1097/01.sla.0000133185.23514.32

and a free circumferential margin have been recognized in the management of rectal cancer.[7] By sharp meticulous perimesorectal dissection and total mesorectal excision (TME), Heald et al[8] and Enker et al[9] have reported low local recurrence rates in patients with rectal cancer. However, routine TME in rectal cancer at all levels has been challenged in view of the increased morbidity associated with TME. The anastomotic leakage rates are high in series of patients with TME.[10] Moreover, the bowel function will also be adversely affected with a low colorectal or coloanal anastomosis.[11] Thus, selective TME according to the level of tumor appears to be a reasonable approach. This study examines the mortality, morbidity, local failure rate, and survival following anterior resection with sharp perimesorectal dissection for rectal cancer with selective TME for mid and distal rectal cancer in a high volume center. Risk factors for anastomotic leakage, local recurrence, and survival are analyzed with univariate and multivariate analysis.

## MATERIALS AND METHODS

During the 10-year period from August 1993 to July 2002, 786 patients underwent resection of primary rectal and rectosigmoid cancer in the Department of Surgery, Queen Mary Hospital, University of Hong Kong Medical Centre. This study included all patients who underwent anterior resection with restoration of the bowel continuity. Patients with abdominoperineal resection (n = 79), Hartmann's operation (n = 44), and local excision (n = 31) were excluded. All the patients had histologically proven adenocarcinoma of the rectum or rectosigmoid. Data on the patients' demographics, comorbidities, operative details, postoperative mortality and morbidity, histologic results, and long-term outcomes were collected prospectively.

During the study period, the operations were performed by the staff of colorectal surgeons or under their supervision. The mobilization of the rectum was performed with sharp dissection under direct vision so that the visceral pelvic fascia, which enclosed the mesorectum, was kept intact. TME, which was defined as the transection of the rectum at the level of the pelvic floor with the entire intact mesorectum, was performed for most patients with mid and distal rectal cancer. For those tumors at upper rectum or rectosigmoid, transection of the rectum and mesorectum 4 to 5 cm below the lower border of the tumor was performed following sharp perimesorectal dissection.

### Surgical Techniques

Preoperative bowel preparation with polyethylene glycol electrolyte solution was given the day before surgery except in patients with obstructing cancers. Counseling by the enterostomal therapist was arranged and the stoma site for proximal diversion was marked before surgery. Prophylactic intravenous antibiotics were given at the induction of anesthesia. The patient was put in the Lloyd Davis position on stirrups and a urethral catheter was inserted after anesthesia had been induced. Most of the patients underwent laparotomy through a lower midline incision. Laparoscopically assisted procedures were performed in selected cases from the year 2000 by the 2 authors (L.W.L. and C.K.W.).

Rectal mobilization was carried out by sharp dissection under the direct vision. The visceral pelvic fascia together with the mesorectum was kept intact during the course of rectal dissection. Efforts were made to identify and preserve the pelvic nerve plexuses during the dissection. The hypogastric nerves were identified at the level of the sacral promontory and the main trunks would be preserved. The lateral ligaments were divided with diathermy, with the retraction of the rectum to the contralateral side. In the anterior dissection, the peritoneum was incised 1 to 2 cm above the rectouterine or rectovesical pouch. In a male patient, the seminal vesicles were separated from the anterior rectal wall, which was covered with fascia propria and the Denovillier's fascia. The Denovillier's fascia was incised close to the level of rectal transection. In a female patient, the anterior dissection separated the vagina from the anterior rectal wall. The rectum was mobilized down to the pelvic floor, and an assessment was made whether a double stapling anastomosis or a transanal coloanal anastomosis was to be constructed. The double stapling technique was our preferred method of anastomosis.

In those with double stapling anastomosis, the rectum was transected at the level of the pelvic floor with the application of a transverse stapler. The rectal stump was irrigated with water when there was enough space distal to the tumor to allow the application of a pair of bowel clamps. A circular stapler of the appropriate size was introduced transanally to perform the double stapling anastomosis with the guidance of the abdominal surgeon. In the initial period of the study, selective proximal diversion was performed. A diversion stoma would be created in case of poor bowel preparation, previous radiation, technical difficulty encountered in dissection, a positive leakage test, incomplete doughnuts, or an very low anastomosis within 3 cm from the anal verge. Loop ileostomy was the preferred mode of proximal diversion in the initial period. After our analysis on the risk factors for anastomotic leakage, proximal diversion was performed in the majority of patients with an anastomosis within 5 cm from the anal verge. Loop transverse colostomy became our preferred mode of diversion after our randomized trial on the optimal mode of proximal diversion.[12]

A transanal coloanal anastomosis would be performed when the transverse stapler could not be applied with adequate margin below the tumor. After full abdominal mobilization of the rectum, the perineal surgeon completed the excision transanally at the dentate line. A hand-sewn interrupted single layer anastomosis was performed at the dentate line. A 5-cm colonic J-pouch constructed with a linear stapler

would be created in the majority of patients with hand-sewn coloanal anastomosis. A stoma for proximal diversion was routinely constructed in this group of patients.

For those patients with cancer of the upper rectum or rectosigmoid, rectal mobilization was also performed by sharp perimesorectal dissection. The rectum would be transected 4 to 5 cm distal to the lower border of the tumor. The mesorectum also would also be divided at that level perpendicular to the rectum. The operation was regarded as partial mesorectal excision (PME).

### Adjuvant Therapy

Adjuvant radiation therapy was not routinely given to patients with stage II or stage III disease. Postoperative chemoradiation was offered only to those when the local clearance was in doubt. In the latter part of the study, preoperative chemoradiation was given to those with fixed T4 lesions. Chemotherapy based on 5-fluorouracil was offered to patients younger than 75 years with stage II or stage III disease.

### Follow-up Protocol

Patients were followed up at intervals of 2 to 3 months during the first 2 years and 4 to 6 months from year 3 to year 5. Thereafter the patients were seen yearly. Follow-up was by history, physical examination, blood tests, and serum carcinoembryonic antigen. Digital rectal examination was performed at each visit to detect any anastomotic stricture or local recurrence. If recurrences were suspected, endoscopic examination and CT scan would be performed to determine whether salvage surgery could be performed.

### Definitions

TME was defined as the excision of the rectum with the surrounding mesorectum enclosed by the visceral pelvic fascia at the level of the pelvic floor. Transection of the mesorectum at a higher level was considered PME.

Rectosigmoid was defined as the zone overlying the sacral promontory that begins with the divergence of the teniae coli proximally and ends when they coalesce to form the longitudinal muscle of the rectum. Cancers within 12 cm from the anal verge were considered as mid and distal rectal cancer.

Resection was defined as curative if all the macroscopic disease could be removed at the end of surgery with negative histologic margin. In the presence of distant disease, surgery was still considered curative if the synchronous metastases were completely removed in the same setting or in subsequent operations.

Clinical anastomotic leak was considered to be present if any of the following features was observed: the presence of peritonitis caused by anastomotic dehiscence; the presence of feculent substances and gas from the pelvic drain; the presence of pelvic abscess with demonstration of anastomotic leak by rectal examination, sigmoidoscopy, or contrast study.

Operative mortality was defined as death that occurred during the hospital stay or within 30 days following the primary operation. Operative morbidities were defined as complications that contributed to prolonged hospital stay or led to additional procedures. All morbidities were documented prospectively.

Local recurrence was defined as the presence of radiologically confirmed or histologically proven tumor in the pelvis within the field of surgery. Isolated local recurrences as well as the presence of both locoregional diseases and distant metastases were included. The time to local recurrence was the duration between time of surgical resection and the time of documentation of the recurrence.

The endpoints of the study were survival and the presence of recurrence during the last follow-up. In the analysis of survival and local recurrence, only patients with curative resection were included. Survival and time to recurrence were calculated from the time of the initial operation.

### Statistics

Comparison of categorical variables was performed with $\chi^2$ test or Fisher exact test when appropriate. Continuous variables were presented as means (standard deviation) or median values (range). These variables were compared with Mann-Whitney *U* test. Survival was analyzed with the Kaplan Meier method and the factors were compared with the log-rank test. Multivariate analysis was performed with Cox proportional hazard model. *P* values of less than 0.05 were considered statistically significant.

## RESULTS

A total of 622 patients underwent anterior resection for primary rectal or rectosigmoid cancer during the study period. There were 395 (63.5%) men and 227 (36.5%) women. The median age was 67 years (range, 31–92 years). The median level of the tumor from the anal verge was 8 cm (range, 2.5–20 cm). Surgery with curative intent was performed in 563 patients (90.5%). Fifty-nine patients (9.5%) had palliative surgery because of unresectable distant metastasis (n = 53) or residual local disease (n = 6).

Premorbid medical condition was present in 268 patients (43.1%) and they are shown in Table 1. The majority of the concomitant medical diseases were hypertension, ischemic heart disease, diabetes, and chronic obstructive airway disease. Twenty-four patients had synchronous cancer in another part of the colon. Sixteen of the synchronous tumors were distal to the splenic flexure and the anterior resection could achieve resection of the synchronous tumors. Eight patients had synchronous cancer at the colon proximal to the splenic flexure and synchronous right colectomy was per-

**TABLE 1.** Comorbidities of Patients With Anterior Resection

| | No. | % |
|---|---|---|
| Cardiac | 163 | 26.2 |
| Hypertension | 125 | |
| Ischemic heart disease | 46 | |
| Arrhythmia | 8 | |
| Diabetes mellitus | 77 | 12.4 |
| Pulmonary disease | 64 | 10.2 |
| COAD | 22 | |
| Bronchiectasis | 3 | |
| Previous tuberculosis | 32 | |
| Asthma | 8 | |
| Neurologic diseases | 23 | 3.7 |
| CVA | 18 | |
| Dementia | 3 | |
| Parkinsonism | 2 | |
| Epilepsy | 1 | |

formed. In another 4 patients, right hemicolectomy was performed for benign lesions of the right colon or appendix.

Stapled anastomosis was performed in 571 patients (83.1%). In the 105 patients (16.9%) with hand-sewn anastomosis, 32 were peranal coloanal anastomosis for ultra-low cancers, while 73 were high anterior resection with sutured anastomosis. The mean operative time was 163 minutes (±58 minutes) and the mean blood loss was 451 mL (± 476 mL). Resection of other organs was required in 53 patients (8.6%). Bladder resection was performed in 15 patients (total cystectomy, n = 10; partial cystectomy, n = 5).

Three patients with potentially curative surgery had positive margin on histology. One of them underwent abdominoperineal resection and remained well 8 years following surgery. The other 2 patients refused further operation and died of liver metastasis at 29 months and local recurrence at 40 months, respectively.

Radiation therapy, usually with chemotherapy, was given to 42 patients (preoperative, n = 21; postoperative, n = 21). Two of the patients showed complete response following neoadjuvant chemoradiation. The UICC (Union Internationale Contre le Cancer)/AJCC (American Joint Committee on Cancer) system was used for staging and the final pathologic stages of the tumors were as follows: 2 stage 0 (0.8%), 100 stage I (16.1%), 228 stage II (36.7%), 239 stage III (38.4%), and 53 stage IV (8.5%).

TME was performed in 396 patients; while in other 226 patients, transection of the rectum and mesorectum (PME) was performed above the pelvic floor either because of high rectal cancer or because of palliative resection. The differences between operations with and without TME are shown in Table 2. Operations with TME were associated with longer operative time, more blood loss, a higher incidence of stoma creation, and a longer hospital stay. The leakage rate was also significantly higher in the TME group. However, the overall postoperative mortality and morbidity did not show any significant differences between patients with TME and PME.

The operative mortality was 1.8%. Eleven patients died in the postoperative period from 2 to 41 days after the surgery. All these patients had premorbid medical diseases. The causes of death included pulmonary embolism (n = 2), myocardial infarction or ischemia (n = 3), pneumonia (n = 2), ischemic bowel (n = 2), liver failure (n = 1), and sepsis

**TABLE 2.** Comparison Between Patients With and Without TME

| | TME (N = 396) | PME (N = 226) | *P* |
|---|---|---|---|
| Men: women | 245:151 | 150:76 | 0.30 |
| Median age (range) | 66 (31–91) | 69 (35–91) | <0.001 |
| Median level of tumor from anal verge (range) (cm) | 7 (2.5–12) | 15 (5–20) | <0.001 |
| Median blood loss (range) (mL) | 400 (30–4500) | 200 (50–2500) | <0.001 |
| Median duration of operation (range) (min) | 165 (62–500) | 132 (50–345) | <0.001 |
| Diversion stoma (%) | 291 (73.5%) | 19 (8.4%) | <0.001 |
| Clinical leak (%) | 32 (8.1%) | 3 (1.3%) | <0.001 |
| Laparoscopic-assisted surgery (%) | 21 (5.3%) | 39 (17.2%) | <0.001 |
| Palliative resection (%) | 21 (5.3%) | 38 (16.8%) | <0.001 |
| Presence of medial illnesses (%) | 152 (38.4%) | 116 (51.3%) | 0.002 |
| Hand-sewn anastomosis (%) | 36 (9.1%) | 69 (30.5%) | <0.001 |
| Complications (%) | 139 (35.1%) | 64 (28.3%) | 0.09 |
| Postoperative mortality (%) | 5 (1.3%) | 6 (2.7%) | 0.22 |
| Median days of hospital stay (range) | 10 (4–89) | 8 (3–57) | <0.001 |

(n = 1). One of the patients who died of myocardial infarction 16 days after the initial operation had anastomotic leakage, which required reoperation.

A total of 203 patients (32.6%) developed intraoperative or postoperative complications. The types of complications are shown in Table 3. Clinical anastomotic leakage occurred in 35 patients (5.6%). Comparison of risk factors for anastomotic leakage is shown in Table 4. Multivariate analysis showed that the use of TME ($P < 0.001$, hazards ratio [HR], 6.3; 95% CI, 3.4–46.7), the male gender ($P < 0.02$, HR, 2.9; 95% CI, 1.2–7.2), the absence of stoma ($P = 0.001$, HR, 4.0; 95% CI, 1.8–9.0), and blood loss more than 500 mL ($P = 0.02$, HR, 2.5; 95% CI, 1.2–5.3) were independent factors for a higher incidence of anastomotic leakage.

## Local Recurrence

With the median follow-up of the surviving patients of 39.6 months (3–109 months), 32 patients developed local recurrence. The actuarial 2-year and 5-year local recurrence rates were 6.0% and 9.7%, respectively. These included patients with local recurrence alone as well as those with both local and distant diseases. Analysis of risk factors for local recurrence is shown in Table 5. On univariate analysis, the peranal anastomosis, the advanced stage, resection margin of less than 2 cm, the presence of perineural invasion, or lymphovascular permeation were risk factors for local recurrence. Figure 1 shows the local recurrence in respect to the stages of the disease. In the multivariate analysis, only the stage of the disease ($P = 0.001$, HR, 2.9; 95% CI, 1.6–5.4) and the use of peranal coloanal anastomosis ($P < 0.001$, HR, 7.2; 95% CI, 3.4–15.1) were independent factors associated with a high incidence of local recurrence.

**TABLE 3.** Postoperative Complications of Patients With Anterior Resection

| | No. of Patients | % |
|---|---|---|
| Intraoperative complications | 6 | 1.0 |
| Splenic injury | 3 | |
| Ureteric injury | 1 | |
| Twisting of colon | 1 | |
| Severe bleeding in pelvis | 1 | |
| Cardiac | 31 | 5.0 |
| Pulmonary | 25 | 4.0 |
| Deep vein thrombosis/pulmonary embolism | 9 | 1.4 |
| Ileus | 23 | 3.7 |
| Intestinal obstruction | 8 | 1.3 |
| Wound complications | 24 | 3.9 |
| Wound infection | 23 | |
| Wound dehiscence | 1 | |
| Urinary tract infection | 18 | 2.9 |
| Urinary retention | 17 | 2.7 |
| Anastomotic leak | 35 | 5.6 |
| Intra-abdominal collection without leak | 3 | 0.5 |
| Bowel ischaemia | 3 | 0.5 |
| Postoperative bleeding | 11 | 1.8 |
| Anastomotic bleeding | 6 | |
| Gastrointestinal bleeding | 4 | |
| Intraabdominal bleeding | 1 | |
| Others | 14 | 2.3 |

**TABLE 4.** Univariate Analysis of Risk Factors for Anastomotic Leakage

| | No. | Number With Leak | *P* |
|---|---|---|---|
| Male | 395 | 27 | 0.10 |
| Female | 227 | 8 | |
| TME | 396 | 32 | <0.001 |
| PME | 226 | 3 | |
| Anterior resection | 173 | 2 | <0.001 |
| Low anterior resection | 449 | 33 | |
| Presence of diversion stoma | 310 | 17 | 1.00 |
| No diversion stoma | 312 | 18 | |
| Stapled anastomosis | 517 | 31 | 0.49 |
| Hand-sewn anastomosis | 105 | 4 | |
| Age < 70 yr | 363 | 26 | 0.05 |
| Age ≥ 70 yr | 259 | 9 | |
| Medical illness | 268 | 16 | 0.86 |
| No medical illness | 354 | 19 | |
| Curative resection | 563 | 30 | 0.07 |
| Palliative resection | 59 | 5 | |
| Level of tumor > 10 cm | 207 | 5 | 0.01 |
| Level of tumor ≤ 10 cm | 415 | 30 | |
| Laparotomy | 561 | 33 | 0.56 |
| Laparoscopic-assisted surgery | 60 | 2 | |
| Blood loss > 500 mL | 145 | 16 | 0.003 |
| Blood loss ≤ 500 mL | 437 | 17 | |
| No preop radiation | 601 | 33 | 0.33 |
| Preop radiation | 21 | 2 | |
| Straight anastomosis (5 with coloplasty) | 561 | 32 | 0.83 |
| J pouch | 61 | 3 | |

## Survival

The 5-year overall survival and cancer-specific survival rated were 66.5% and 74.5%, respectively. The univariate analysis of the risk factors for the cancer-specific survival is shown in Table 5. Survival curves showing the relations of survival to the performance of TME and the stages are shown in Figures 2 and 3. Multivariate analysis showed that the stage of disease, the presence lymphovascular as well as

**TABLE 5.** Univariate Analysis of Risk Factors for Local Recurrence

| | No. of Patients (N = 563) | 5-year Actuarial Local Recurrence(%) | *P* | 5-year Cancer-Specific Survival(%) | *P* |
|---|---|---|---|---|---|
| Male | 350 | 11.8 | 0.067 | 72.6 | 0.58 |
| Female | 213 | 6.0 | | 77.3 | |
| Age ≥ 70 yr | 238 | 8.0 | 0.64 | 70.6 | 0.07 |
| Age < 70 yr | 325 | 10.2 | | 77.1 | |
| Anastomosis | | | 0.005 | | 0.58 |
| Stapler | 471 | 7.1 | | 75.4 | |
| Hand-sewn | 92 | 18.0 | | 71.7 | |
| Abdominal | 61 | 6.0 | | | |
| Peranal coloanal | 31 | 33.0 | | | |
| Abdominal anastomosis | 531 | 6.9 | <0.001 | 76.3 | 0.11 |
| Peranal anastomosis | 31 | 33.0 | | 61.7 | |
| Level ≤ 10 cm | 380 | 10.1 | 0.44 | 74.9 | 0.53 |
| Level > 10 cm | 183 | 8.1 | | 74.0 | |
| TME | 375 | 10.7 | 0.20 | 74.0 | 0.99 |
| PME | 188 | 7.4 | | 76.1 | |
| Anastomotic leak | 30 | 14.0 | 0.19 | 74.8 | 0.68 |
| No anastomotic leak | 533 | 9.2 | | 70.7 | |
| No resection of other organs | 510 | 8.9 | 0.30 | 62.3 | 0.09 |
| Resection of other organs | 48 | 19 | | 75.9 | |
| Stage | | | 0.01 | | <0.001 |
| 0 or I | 102 | 0 | | 96.6 | |
| II | 224 | 8.6 | | 79.4 | |
| III | 227 | 14.8 | | 60.8 | |
| Lymphovascular invasion | | | 0.03 | | <0.001 |
| Yes | 137 | 14.8 | | 52.0 | |
| No | 415 | 8.7 | | 80.4 | |
| Perineural invasion | | | 0.02 | | <0.001 |
| Yes | 48 | 17.1 | | 27.6 | |
| No | 503 | 9.3 | | 78.7 | |
| Adjuvant RT | | | 0.36 | | 0.02 |
| Yes | 36 | 9.2 | | 55.6 | |
| No | 527 | 9.4 | | 75.9 | |
| Adjuvant chemotherapy | | | 0.51 | | 0.34 |
| Yes | 320 | 9.6 | | 69.6 | |
| No | 243 | 9.1 | | 77.8 | |
| Distal margin | | | <0.001 | | 0.56 |
| >2 cm | 380 | 5.4 | | 76.4 | |
| <2 cm | 183 | 17.2 | | 71.2 | |

perineural permeation were independent variables associated with poor disease-specific survival.

## DISCUSSION

The optimal treatment of rectal cancer should maximize sphincter preservation with low morbidity and mortality. Moreover, favorable oncological outcomes in terms of a low local recurrence rate and a high survival rate are also important considerations. The surgical technique plays an important role to achieve these short-term and long-term goals. In the recent 2 decades, anterior resection with mesorectal excision has become the optimal treatment of rectal cancer.

Sharp meticulous dissection to keep the visceral layer of the pelvic fascia intact is important to avoid breach in the mesorectum, which is now considered an important cause for local recurrence. Heald et al[8]as well as Enker et al[9,13] have

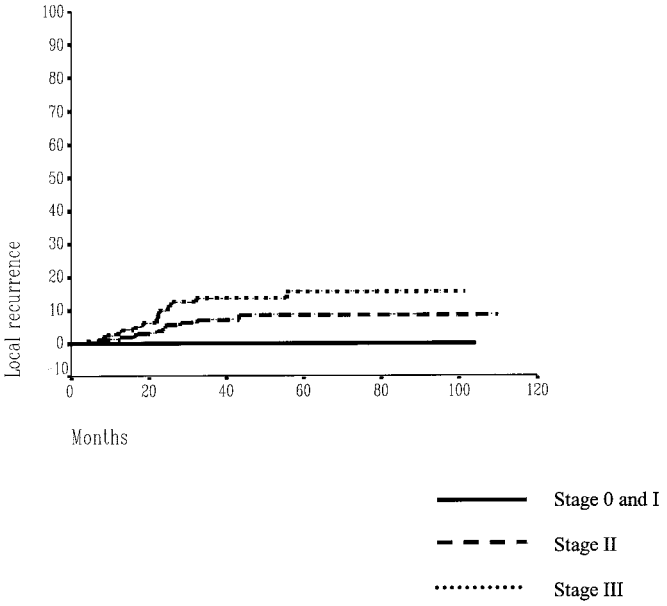


**FIGURE 1.** Local recurrence following anterior resection with stage of the disease

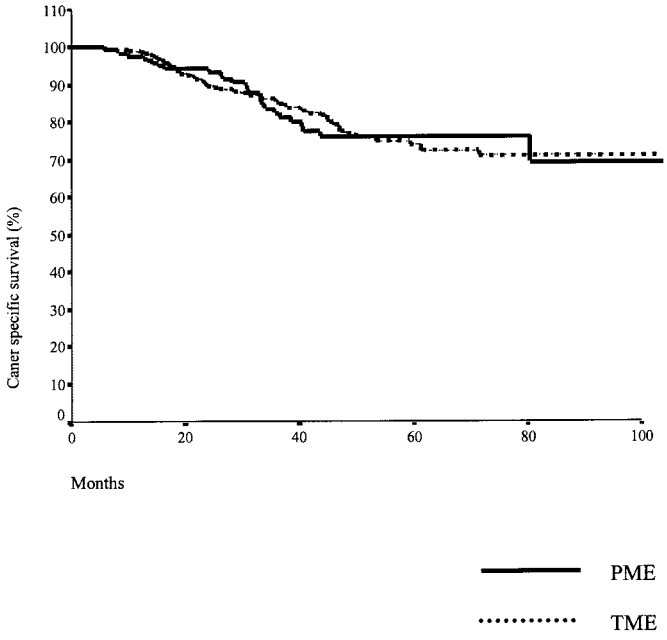


**FIGURE 2.** Cancer-specific survival of patients with TME and PME

reported low local recurrence rates using this technique in a sizable number of patients. The use of sharp perimesorectal dissection and the practice of "close shave" anterior resection have also increased the sphincter saving rate. Heald et al reported that abdominoperineal resection was only required in 23% of patients with tumors in the lower rectum.[14] In our review of patients with tumor within 6 cm from the anal

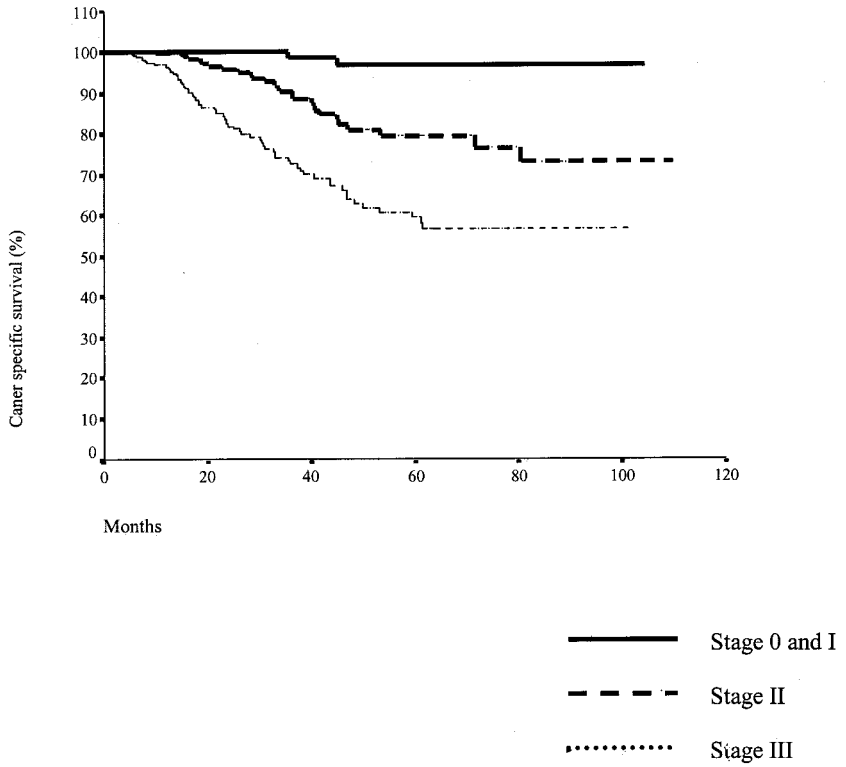


**FIGURE 3.** Cancer-specific survival of patients with stages

verge, abdominoperineal resection was performed in only 27.8% of patients.[15]

In the original series by Heald et al,[8] TME was performed in patients with upper rectal cancer. Routine TME in rectal cancer at all levels is now considered unnecessary. Lopez-Kostner et al demonstrated that outcomes of treatment of upper rectal cancer in terms of local recurrence and survival were similar to those of sigmoid cancer and that TME was not necessary in upper rectal lesions.[16]

The present report studied the differences between anterior resection with and without TME using the approach of selective TME according to the level of the tumor. It revealed that TME was a more complex operation. The blood loss and duration of surgery in patients with TME compared favorably with the series of Heald et al[8,17] and Enker et al[13] as well as the report from the multicenter randomized trial by the Dutch Colorectal Cancer Group.[18] However, when compared with anterior resection with PME, operations with TME were associated with a longer operation time and more blood loss. There was also a tendency of a higher morbidity rate in patients with TME, although it did not reach statistical significance. Moreover, the median hospital stay was also longer in patients with TME.

Anastomotic leak is the important complication associated with TME. As the risk of anastomotic leakage depends on the level of the anastomosis,[19,20] the incidence of leakage following TME is bound to be high because the colorectal or coloanal anastomosis is invariably performed at the level of the pelvic floor. Karanjia et al reported that the leakage rate following TME was 17%.[10] In our previous study, we found that the leakage rate following TME with the anastomosis within 5 cm from the anal verge in 196 patients was 10.2%.[21] We also found that the presence of a diversion stoma was an independent factor for a lower anastomotic leakage rate. In the present series, with the more liberal proximal diversion (73.5% in TME), the leakage rate following TME was 8.1%. However, in those patients with anterior resection with PME, the leakage rate was only 1.3% and diversion stomas were only created in 8.4% of patients. Surgery with TME was found to an independent factor for anastomotic leakage. Thus, in view of the complexity of the operation, the higher incidence anastomotic leakage as well as increased likelihood of a diversion stoma, the operation should be reserved for those who really need complete removal of the mesorectum, namely, those with the tumors at the mid or distal rectum.

Local recurrence is the most important measure of the oncologic outcome following rectal cancer surgery. Conventional rectal surgery, either by abdominoperineal resection or anterior resection, was associated with a high local recurrence rate.[4–6] The management of local recurrence is difficult and salvage surgery for local recurrence is rarely possible, especially in cases following TME.

There has been no uniformity in the reports of local recurrence following rectal cancer surgery. Differences in case selection and the definition of local recurrence as well as the way of calculation are seen in the literature. It is now generally accepted that the recurrence rate should include both local recurrence alone and those with distant metastasis. The local recurrence rate should be calculated with the life table method.[22]

In our study, the actuarial 5-year local recurrence rate is 9.7% and this is comparable to most series with TME.[9,17,23–25] This is achieved in a cohort of patients in whom 84% had advanced tumors (either transmural invasion and/or lymph node metastasis). Radiation therapy was only given to 7% of patients with curative resection. The stage of the disease and the performance of peranal coloanal anastomosis were found to be associated with an increased risk of local recurrence in this group of patients. There was no difference in the local recurrence rate in tumor at upper rectum and rectosigmoid when compared with those in the mid and distal rectum. The local recurrence rates in those patients with and without TME were also similar. Thus, anterior resection without TME is appropriate for those with cancer at the upper rectum and rectosigmoid. In other words, by performing TME in patients with mid and distal rectal cancer, the local recurrence rate approaches that of the rectal cancers situated more proximally.

Those tumors at the very distal rectum that necessitated peranal coloanal anastomosis were associated with a high recurrence rate. Peranal coloanal anastomoses were mostly done in the earlier period of the study with the tumor within 1 to 2 cm from the dentate line. The margin of resection was very close in these patients and there was no extra 0.5 to 1 cm margin provided by the application of the circular stapler. After our analysis showed the poor results in patients with coloanal anastomosis as well as those treated with abdominoperineal resection, preoperative chemoradiation was offered to these patients with very distal rectal cancer in case of transmural invasion or the presence of lymph node metastasis.[15] In those patients with stapled anastomosis or hand-sewn anastomosis in the pelvis, the local recurrence rate was only 6.9%. Although Kapiteijn et al[18] showed that preoperative short-course radiation in TME was associated with a lower 2-year local recurrence rate than the group without radiation, the routine administration of radiation to all patients with rectal cancer has not got universal acceptance. Most surgeons would still administer adjuvant therapy according to the results of their institutions.[26] With the low local recurrence rate in patients with anastomosis done in the pelvis by double stapling technique, we do not feel routine radiation in this group of patients is justified.

The cancer-specific survival was 74.5%, which is comparable with others' results.[9,23,24] Survival was related to the histologic characteristics of the tumor such as the stage and

the presence of lymphovascular invasion. The level of the tumor as well as whether TME has been performed were not determining factors for survival. Thus, tumor at upper rectum and rectosigmoid can be treated without TME to yield similar survival. With the performance of TME for mid and distal rectal cancer, the local recurrence rate of rectal cancer approaches that of colon cancer. The survival would be dependent on the presence of distant metastasis. Zabeer et al[27] showed that 30% of the recurrence occurred distantly. Whether survival following rectal cancer surgery could be improved with postoperative chemotherapy alone, as in colonic cancer, is yet to be seen. In this study, we could not demonstrate survival benefit in patients with adjuvant chemotherapy. However, a randomized controlled trial in this aspect is necessary to establish the role of postoperative chemotherapy.

## CONCLUSION

Anterior resection is the safe and preferred option for rectal cancer with low mortality and acceptable morbidity. Partial mesorectal excision for cancer at the upper rectum or rectosigmoid yields with similar results when compared with total mesorectal excision for mid and distal rectal cancer in terms of local recurrence and survival. However, total mesorectal excision is a more complex operation, which is associated with a longer operating time, more blood loss, longer hospital stay, a higher leakage rate, and a higher stoma rate. Thus, selective approach using total mesorectal excision for mid and distal rectal cancer is more appropriate and reasonable approach.

## REFERENCES


1. Williams NS, Dixon MF, Johnston D. Reappraisal of the 5 centimetre rule of distal excision for carcinoma of the rectum: a study of distal intramural spread and of patients' survival. *Br J Surg*. 1983;70:150–154.
2. Griffen FD, Knight CD Sr, Whitaker JM, et al. The double stapling technique for low anterior resection: results, modifications, and observations. *Ann Surg*. 1990;211:745–751.
3. Knight CD, Griffen FD. An improved technique for low anterior resection of the rectum using the EEA stapler. *Surgery*. 1980;88:710–714.
4. Nymann T, Jess P, Christiansen J. Rate and treatment of pelvic recurrence after abdominoperineal resection and low anterior resection for rectal cancer. *Dis Colon Rectum*. 1995;38:799–802.
5. Pilipshen SJ, Heilweil M, Quan SH, et al. Patterns of pelvic recurrence following definitive resections of rectal cancer. *Cancer*. 1984;53:1354–1362.
6. Pahlman L, Glimelius B. Local recurrences after surgical treatment for rectal carcinoma. *Acta Chir Scand*. 1984;150:331–335.
7. Heald RJ, Husband EM, Ryall RD. The mesorectum in rectal cancer surgery: the clue to pelvic recurrence? *Br J Surg*. 1982;69:613–616.
8. Heald RJ, Moran BJ, Ryall RD, et al. Rectal cancer: the Basingstoke experience of total mesorectal excision, 1978–1997. *Arch Surg*. 1998;133:894–899.
9. Enker WE, Thaler HT, Cranor ML, et al. Total mesorectal excision in the operative treatment of carcinoma of the rectum. *J Am Coll Surg*. 1995;181:335–346.
10. Karanjia ND, Corder AP, Bearn P, et al. Leakage from stapled low anastomosis after total mesorectal excision for carcinoma of the rectum. *Br J Surg*. 1994;81:1224–1226.
11. Karanjia ND, Schache DJ, Heald RJ. Function of the distal rectum after low anterior resection for carcinoma [see comments]. *Br J Surg*. 1992;79:114–116.
12. Law WL, Chu KW, Choi HK. Randomized controlled trial comparing loop ileostomy and loop transverse colostomy for faecal diversion following total mesorectal excision. *Br J Surg*. 2002;89:704–708.
13. Enker WE, Merchant N, Cohen AM, et al. Safety and efficacy of low anterior resection for rectal cancer: 681 consecutive cases from a specialty service. *Ann Surg*. 1999;230:544–552.
14. Heald RJ, Smedh RK, Kald A, et al. Abdominoperineal excision of the rectum: an endangered operation [Norman Nigro Lectureship]. *Dis Colon Rectum*. 1997;40:747–751.
15. Law WL, Chu KW. Impact of total mesorectal excision on the results of surgery of distal rectal cancer. *Br J Surg*. 2001;88:1607–1612.
16. Lopez-Kostner F, Lavery IC, Hool GR, et al. Total mesorectal excision is not necessary for cancers of the upper rectum. *Surgery*. 1998;124:612–617.
17. MacFarlane JK, Ryall RD, Heald RJ. Mesorectal excision for rectal cancer. *Lancet*. 1993;341:457–460.
18. Kapiteijn E, Marijnen CA, Nagtegaal ID, et al. Preoperative radiotherapy combined with total mesorectal excision for resectable rectal cancer. *N Engl J Med*. 2001;345:638–646.
19. Vignali A, Fazio VW, Lavery IC, et al. Factors associated with the occurrence of leaks in stapled rectal anastomoses: a review of 1,014 patients. *J Am Coll Surg*. 1997;185:105–113.
20. Pakkastie TE, Luukkonen PE, Jarvinen HJ. Anastomotic leakage after anterior resection of the rectum. *Eur J Surg*. 1994;160:293–297.
21. Law WL, Chu KW, Ho JW, et al. Risk factors for anastomotic leakage after low anterior resection with total mesorectal excision. *Am J Surg*. 2000;179:92–96.
22. Dent OF, Chapuis PH, Bokey EL, et al. Methodology and reporting in studies of local recurrence after curative excision of the rectum for cancer. *Br J Surg*. 2001;88:1476–1480.
23. Martling AL, Holm T, Rutqvist LE, et al. Effect of a surgical training programme on outcome of rectal cancer in the County of Stockholm. Stockholm Colorectal Cancer Study Group, Basingstoke Bowel Cancer Research Project. *Lancet*. 2000;356:93–96.
24. Arenas RB, Fichera A, Mhoon D, et al. Total mesenteric excision in the surgical treatment of rectal cancer: a prospective study. *Arch Surg*. 1998;133:608–611.
25. Tocchi A, Mazzoni G, Lepre L, et al. Total mesorectal excision and low rectal anastomosis for the treatment of rectal cancer and prevention of pelvic recurrences. *Arch Surg*. 2001;136:216–220.
26. Seow-Choen F. Adjuvant therapy for rectal cancer cannot be based on the results of other surgeons. *Br J Surg*. 2002;89:946–947.
27. Zaheer S, Pemberton JH, Farouk R, et al. Surgical treatment of adenocarcinoma of the rectum. *Ann Surg*. 1998;227:800–811.